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**oSIST prEN 50600-4-7:2019**  
**01-julij-2019**

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**Informacijska tehnologija - Naprave in infrastruktura podatkovnih centrov - 4-7.  
del: Faktor učinkovitosti hlajenja**

Information technology - Data centre facilities and infrastructures - Part 4-7: Cooling Efficiency Ratio (CER)

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**Ta slovenski standard je istoveten z: prEN 50600-4-7:2019**

**ICS:**

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ICS

English Version

**Information technology - Data centre facilities and infrastructures  
- Part 4-7: Cooling Efficiency Ratio (CER)**

To be completed

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This draft European Standard is submitted to CENELEC members for enquiry.  
Deadline for CENELEC: 2019-08-09.

It has been drawn up by CLC/TC 215.

If this draft becomes a European Standard, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CENELEC in three official versions (English, French, German).  
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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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European Committee for Electrotechnical Standardization  
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Europäisches Komitee für Elektrotechnische Normung

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| 1  | <b>Contents</b>  | Page |
|----|--|------|
| 2  | <b>European Foreword</b> .....   | 4    |
| 3  | <b>Introduction</b> .....  | 5    |
| 4  | <b>1 Scope</b> .....   | 8    |
| 5  | <b>2 Normative references</b> .....  | 8    |
| 6  | <b>3 Terms, definitions and abbreviations</b> .....                                      | 8    |
| 7  | 3.1 Terms and definitions .....  | 8    |
| 8  | 3.2 Abbreviations .....  | 9    |
| 9  | <b>4 Applicable area of the data centre</b> .....  | 9    |
| 10 | <b>5 Determination of Cooling Efficiency Ratio</b> .....                                 | 10   |
| 11 | 5.1 Definition of CER .....  | 10   |
| 12 | 5.2 Determining total energy use in multi-purpose buildings using CER .....              | 10   |
| 13 | <b>6 Measurement of Cooling Efficiency Ratio</b> .....                                   | 11   |
| 14 | 6.1 General .....  | 11   |
| 15 | 6.2 Requirements.....  | 11   |
| 16 | 6.3 Recommendations .....  | 11   |
| 17 | <b>7 Reporting of CER</b> .....  | 12   |
| 18 | 7.1 General .....  | 12   |
| 19 | 7.2 Requirements.....  | 12   |
| 20 | 7.3 Recommendations .....  | 12   |
| 21 | <b>Annex A (informative) Correlation of CER and other KPIs</b> .....                     | 13   |
| 22 | <b>A.1 General</b> .....   | 13   |
| 23 | <b>A.2 Discussion of existing terms for performance rating</b> .....                     | 13   |
| 24 | <b>Annex B (normative) Examples of usage of CER</b> .....                                | 14   |
| 25 | <b>B.1 Determining PUE in data centres with different computer rooms using CER</b> ..... | 14   |
| 26 | <b>B.2 Determining CER in cases of energy re-use</b> .....                               | 14   |
| 27 | <b>Annex C (informative) Parameters influencing CER</b> .....                            | 15   |
| 28 | <b>C.1 Adjustment of temperature</b> .....   | 15   |
| 29 | <b>C.2 Demand of cooling</b> .....   | 15   |
| 30 | <b>Annex D (normative) Derivates of CER</b> .....  | 16   |
| 31 | <b>D.1 Definition of iCER</b> .....  | 16   |
| 32 | <b>D.2 Determination of Cooling Performance Ratio</b> .....                              | 16   |
| 33 | <b>D.2.1 Definition of CPR</b> .....   | 16   |
| 34 | <b>D.2.2 Measurement of CPR</b> .....  | 16   |
| 35 | <b>D.2.2.1 Requirements</b> .....  | 16   |
| 36 | <b>D.2.2.2 Recommendations</b> .....   | 16   |

|    |   |    |
|----|---|----|
| 37 | <b>D.2.3 Reporting of CPR</b> .....                 | 17 |
| 38 | <b>D.2.3.1 Requirements</b> .....                   | 17 |
| 39 | <b>D.2.3.2 Recommendations</b> .....                | 17 |
| 40 | <b>D.2.4 Using CPR in Capacity Management</b> ..... | 17 |
| 41 | <b>D.3 Determination of CEF</b> .....               | 17 |
| 42 | <b>D.3.1 Definition of CEF</b> .....                | 17 |
| 43 | <b>D.3.2 Definition of partial CEF (pCEF)</b> ..... | 17 |
| 44 | <b>D.3.3 Example</b> .....                          | 18 |
| 45 | <b>Bibliography</b> .....                           | 19 |
| 46 |   |    |

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prEN 50600-4-7:2019 (E)

## 47 **European foreword**

48 This document (prEN 50600-4-7:2019) has been prepared by CLC/TC 215 "Electrotechnical aspects of  
49 telecommunication equipment".

50 This document is currently submitted to the Enquiry.

51 The following dates are proposed:

- latest date by which the existence of this document has to be announced at national level (doa) dor + 6 months
- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) dor + 12 months
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) dor + 36 months (to be confirmed or modified when voting)

52 This document has been prepared under a mandate given to CENELEC by the European Commission and  
53 the European Free Trade Association.

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## 54 Introduction

55 The unrestricted access to internet-based information demanded by the information society has led to an  
56 exponential growth of both internet traffic and the volume of stored/retrieved data. Data centres are housing  
57 and supporting the information technology and network telecommunications equipment for data processing,  
58 data storage and data transport. They are required both by network operators (delivering those services to  
59 customer premises) and by enterprises within those customer premises.

60 Data centres need to provide modular, scalable and flexible facilities and infrastructures to easily  
61 accommodate the rapidly changing requirements of the market. In addition, energy consumption of data  
62 centres has become critical both from an environmental point of view (reduction of carbon footprint) and with  
63 respect to economic considerations (cost of energy) for the data centre operator.

64 The implementation of data centres varies in terms of:

- 65 a) purpose (enterprise, co-location, co-hosting, or network operator facilities);
- 66 b) security level;
- 67 c) physical size;
- 68 d) accommodation (mobile, temporary and permanent constructions).

69 The needs of data centres also vary in terms of availability of service, the provision of security and the  
70 objectives for energy efficiency. These needs and objectives influence the design of data centres in terms of  
71 building construction, power distribution, environmental control and physical security. Effective management  
72 and operational information is required to monitor achievement of the defined needs and objectives.

73 This series of European Standards specifies requirements and recommendations to support the various  
74 parties involved in the design, planning, procurement, integration, installation, operation and maintenance of  
75 facilities and infrastructures within data centres. These parties include:

- 76 1) owners, facility managers, ICT managers, project managers, main contractors;
- 77 2) architects, consultants, building designers and builders, system and installation designers;
- 78 3) facility and infrastructure integrators, suppliers of equipment;
- 79 4) installers, maintainers.

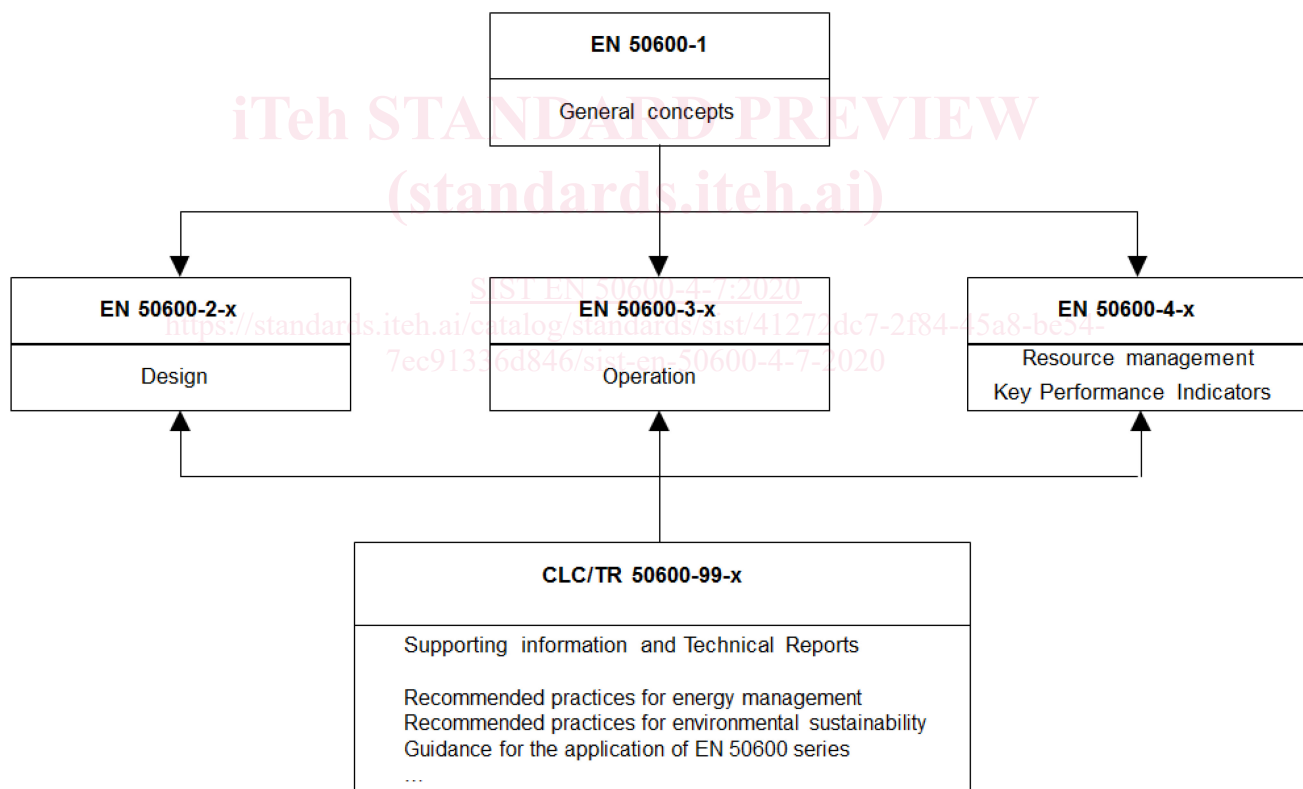
80 At the time of publication of this European Standard, the EN 50600 series will comprise the following  
81 standards and documents:

- 82 — EN 50600-1, *Information technology — Data centre facilities and infrastructures — Part 1: General*  
83 *concepts*;
- 84 — EN 50600-2-1, *Information technology — Data centre facilities and infrastructures — Part 2-1: Building*  
85 *construction*;
- 86 — EN 50600-2-2, *Information technology — Data centre facilities and infrastructures — Part 2-2: Power*  
87 *distribution*;
- 88 — EN 50600-2-3, *Information technology — Data centre facilities and infrastructures — Part 2-3:*  
89 *Environmental control*;
- 90 — EN 50600-2-4, *Information technology — Data centre facilities and infrastructures — Part 2-4:*  
91 *Telecommunications cabling infrastructure*;
- 92 — EN 50600-2-5, *Information technology — Data centre facilities and infrastructures — Part 2-5: Security*  
93 *systems*;

prEN 50600-4-7:2019 (E)

- 94 — EN 50600-3-1, *Information technology — Data centre facilities and infrastructures — Part 3-1: Management and operational information*;
- 95
- 96 — EN 50600-4-1, *Information technology — Data centre facilities and infrastructures — Part 4-1: Overview of and general requirements for key performance indicators*;
- 97
- 98 — EN 50600-4-2, *Information technology — Data centre facilities and infrastructures — Part 4-2: Power Usage Effectiveness*;
- 99
- 100 — EN 50600-4-3, *Information technology — Data centre facilities and infrastructures — Part 4-3: Renewable Energy Factor*;
- 101
- 102 — CLC/TR 50600-99-1, *Information technology — Data centre facilities and infrastructures — Part 99-1: Recommended practices for energy management*;
- 103
- 104 — CLC/TR 50600-99-2, *Information technology — Data centre facilities and infrastructures — Part 99-2: Recommended practices for environmental sustainability*;
- 105
- 106 — CLC/TR 50600-99-3, *Information technology — Data centre facilities and infrastructures — Part 99-3: Guidance to the application of EN 50600 series*
- 107

108 The inter-relationship of the standards within the EN 50600 series is shown in Figure 1.



109

110 **Figure 1 — Schematic relationship between the EN 50600 series of documents**

111 EN 50600-2-X standards specify requirements and recommendations for particular facilities and  
 112 infrastructures to support the relevant classification for “availability”, “physical security” and “energy efficiency  
 113 enablement” selected from EN 50600-1.

114 EN 50600-3-X documents specify requirements and recommendations for data centre operations, processes  
 115 and management.

116 EN 50600-4-X documents specify requirements and recommendations for key performance indicators (KPIs)  
 117 used to assess and improve the resource usage efficiency and effectiveness, respectively, of a data centre.



- 118 In today's digital society data centre growth, and power consumption in particular, is an inevitable  
119 consequence and that growth will demand increasing power consumption despite the most stringent energy  
120 efficiency strategies. This makes the need for key performance indicators that cover the effective use of  
121 resources (including but not limited to energy) and the reduction of CO<sub>2</sub> emissions essential.
- 122 NOTE Within the EN 50600-4-X series, the term "resource usage effectiveness" is more generally used for KPIs in  
123 preference to "resource usage efficiency", which is restricted to situations where the input and output parameters used to  
124 define the KPI have the same units.
- 125 In order to enable the optimum resource effectiveness of data centres a suite of effective KPIs is needed to  
126 measure and report on resources consumed in order to develop an improvement roadmap.
- 127 These standards are intended to accelerate the provision of operational infrastructures with improved  
128 resource usage effectiveness.
- 129 This European Standard specifies Cooling Efficiency Ratio to determine the efficient utilization of energy  
130 resources to provide the temperature control required by spaces of the data centre.
- 131 Additional standards in the EN 50600-4-X series will be developed, each describing a specific KPI for  
132 resource usage effectiveness or efficiency.
- 133 The EN 50600-4-X series does not specify limits or targets for any KPI and does not describe or imply, unless  
134 specifically stated, any form of aggregation of individual KPIs into a combined nor an overall KPI for data  
135 centre resource usage effectiveness or efficiency.
- 136 This European Standard is intended for use by and collaboration between data centre managers, facility  
137 managers, ICT managers, and main contractors.
- 138 This series of European Standards does not address the selection of information technology and network  
139 telecommunications equipment, software and associated configuration issues.

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## 140 1 Scope

141 This document specifies the Cooling Efficiency Ratio (CER) as a Key Performance Indicator (KPI) to quantify  
142 the efficient use of energy to control the temperature of the spaces within the data centre.

143 This document:

144 a) defines the Cooling Efficiency Ratio (CER) of a data centre;

145 b) describes the relationship of this KPI to a data centre's infrastructure, information technology equipment  
146 and information technology operations;

147 c) defines the measurement, the calculation and the reporting of the parameter;

148 d) provides information on the correct interpretation of the CER.

149 Annex A describes other KPIs related KPIs.

150 Annex B provides examples of the application of CER.

151 Annex C introduces the parameters that affect CER

152 Annex D describes requirements and recommendations for derivatives of and KPIs associated with CER.

## 153 2 Normative references

154 The following documents are referred to in the text in such a way that some or all of their content constitutes  
155 requirements of this document. For dated references, only the edition cited applies. For undated references,  
156 the latest edition of the referenced document (including any amendments) applies.

157 EN 50600-1, *Information technology - Data centre facilities and infrastructures - Part 1: General concepts*

158 EN 50600-4-1, *Information technology - Data centre facilities and infrastructures - Part 4-1: Overview of and  
159 general requirements for key performance indicators*

## 160 3 Terms, definitions and abbreviations

### 161 3.1 Terms and definitions

162 For the purposes of this document, the terms and definitions given in EN 50600-1 and the following apply.

163 ISO and IEC maintain terminological databases for use in standardization at the following addresses:

164 — IEC Electropedia: available at <http://www.electropedia.org/>

165 — ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 166 3.1.1

##### 167 **Cooling Efficiency Ratio**

168 ratio of total heat removed and electrical energy used by a cooling system

#### 169 3.1.2

##### 170 **Cooling Performance Ratio**

171 ratio of actual heat load and electrical power used by a cooling system

### 172 3.2 Abbreviations

173 For the purposes of this document, the abbreviations given in EN 50600-1, EN 50600-4-1 and the following  
174 apply.

|                       |   |
|-----------------------|---|
| CEF                   | Cooling Efficiency Factor   |
| CER                   | Cooling Efficiency Ratio  |
| CPR                   | Cooling Performance Ratio   |
| $E_{\text{Cooling}}$  | Electrical Energy used by cooling systems   |
| $E_{\text{Cool, DC}}$ | Part of $E_{\text{Cooling}}$ that is accounted to the data centre                       |
| $E_{\text{heat}}$     | Electrical Energy transferred to heat   |
| $E_{\text{HVAC}}$     | Electrical Energy used by air conditioning systems                                      |
| $E_{\text{IT}}$       | Electrical Energy used by IT equipment  |
| $E_{\text{UPSloss}}$  | Electrical Energy loss in UPS   |
| $E_{\text{total}}$    | Total energy used by the data centre calculated from CER                                |
| HVAC                  | Heating, Ventilation, Air Conditioning  |
| iCER                  | interim Cooling Efficiency Ratio  |
| KPI                   | Key Performance Indicator   |
| Q                     | actual heat load from data centre   |
| $Q_{\text{removed}}$  | heat quantity removed by the cooling system   |
| $P_{\text{Cooling}}$  | actual electrical power of the cooling systems  |
| PUE                   | Power Usage Effectiveness   |
| pCEF                  | partial Cooling Efficiency Factor   |
| pPUE                  | partial Power Usage Effectiveness   |
| pPUE <sub>HVAC</sub>  | partial Power Usage Effectiveness for heating, ventilation and air conditioning systems |

### 175 4 Applicable area of the data centre

176 Cooling Efficiency Ratio (CER) as specified in this standard:

- 177 a) is associated with the data centre infrastructure within its boundaries only;
- 178 b) describes the efficiency of a cooling system with respect to its electrical energy use.

179 Derivatives of CER which are useful in certain circumstances are described in Annex A (Cooling Performance  
180 Ratio (CPR)) and Annex C (interim CER (iCER)).